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ABSTRACT

The impact of the educational programs of zoos on the recreational visitor is addressed in this report. Unobtrusive or nonreactive research methods were employed as primary evaluative techniques by graduate social science students conducting six research projects at the Los Angeles Zoo. These studies were designed and implemented to examine: (1) visitor turning preference; (2) determinants of holding power of zoo exhibits; (3) reading signs at zoo exhibits; (4) children's reactions to animals in a petting zoo; (5) the stereotypes zoo visitors may hold about selected animals; and (6) intergenerational communication. It is suggested that nonreactive measures are particularly appropriate for these types of evaluation studies because they do not impose on visitors or require their cooperation, and because they reduce problems with sampling and response bias. (A review of the literature pertaining to education in zoos is also provided.) (ML)

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HOW AND WHAT

RECREATIONAL VISITORS

LEARN AT ZOOS

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Paper Presented at the Annual Western Meeting of the
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Anchorage, Alaska
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ABSTRACT

HOW AND WHAT RECREATIONAL VISITORS LEARN AT ZOOS

Nonreactive research methods may provide a means for filling some of the gaps in our knowledge of the educational impact of zoos on recreational visitors. To test this concept, six teams of three graduate students each were limited to such methods and given ten weeks to design, propose, carry out and report on certain aspects of human behavior at the Los Angeles Zoo.

Two studies addressed general patterns of visitor movement through the zoo; one addressed sign reading, two addressed affective learning and one addressed interactions among individuals within visitor groups. Results contributed to understanding of the educational impact of zoos, and to improving such studies in future.

HOW AND WHAT DO RECREATIONAL VISITORS LEARN AT ZOOS?

INTRODUCTION

Ken Nieland began the conference yesterday by reminding us of the four traditional goals of zoos (conservation, recreation, research and education). The educational role of zoos involves at least five distinct groups: professional zoo personnel such as keepers, volunteer zoo personnel such as docents, attendees at lectures and courses offered by zoos and open to the public, public school and university students and recreational visitors.

Zoo personnel most commonly think of research in terms of animal care, breeding programs or behavioral studies. Although education is a major goal of zoos, there has been relatively little effort to evaluate the impact of the many programs aimed at these various groups. I hope to concentrate my research energies on this question, limiting it initially to the specific case of the recreational visitor.

I have chosen to start with recreational visitors because they pose interesting methodological problems not shared with the other groups. For reasons discussed elsewhere (Churchman, 1984) it is very difficult to achieve satisfactory reliability and validity with traditional research methods such as interviews, questionnaires and tests when working with this population.

Therefore, I hope to develop the potential for evaluating the education of recreational visitors using what are termed unobtrusive or nonreactive measures over a three year period that began in Spring 1984. These methods, which I will describe below, never will be adequate of themselves to answer the larger

question. But, their strengths and weaknesses are almost exactly the opposite of traditional methods. Thus, combining the two methods in the latter years of the study should provide a highly reliable, valid and comprehensive answer to the question implied by my title.

Therefore, in the tradition of conferences, I want to begin by issuing a disclaimer: the title of my paper is the goal of a seven-year research plan that I am not ready to answer completely after only one year's work.

LITERATURE REVIEW

Education in Zoos

The literature, at least in English, on the educational impact of zoos is so sparse that it is useful to consider it in combination with the only slightly richer research literature on museums.

When interviewed, visitors are neither surprised nor do they object to questions concerning what they have learned. Rather, all readily accepted the assumption that they should have learned something. Most visitors to the Hirshhorn responded to questions as to their purposes in coming in such terms as learning more about modern art and exposing their children to modern art, answers suggesting learning is one important motivation for museum visits (Wolf and Tymitz, 1978).

The primary educational component of zoo exhibits are the animals themselves. Learning is both cognitive and affective, and varies among visitors on the basis of their previous knowledge. Shettel (1976), found that many museum visitors arrive with most of the knowledge that exhibits are intended to

impart. Sommer (1972) points to the danger of miseducation inherent in zoo animals that may "display sexual aberrations, a heavy incidence of aggression, and the blah-ness common to many animals that don't have anything to do in a concrete cage." We had a perfect example this morning when pronghorn antelope that will follow park trams "like dogs" and have even attempted to climb on with the people were mentioned.

Animal enclosures also have an educational value. Crandall (nd) believes that making zoo enclosures as much like the natural habitat of animals as possible produces the kind of exhibit that causes the public to be aware of the zoo as a place of learning. Finding animals in natural exhibits interests and challenges many visitors. But, experienced zoo staff know that visitors often walk away from such natural exhibits because they cannot find the animals or cannot see them easily.

A more subtle educational device is the way enclosures are grouped. Zoos usually do so according to some principle, such as regions of the world, ecosystems or taxonomy. The only study identified which addresses the extent to which visitors learn anything from exhibit groupings was conducted at the Smithsonian. Wolf and Tymitz (1978) report comments such as "The exhibit has a flow to it and that helps to show the messages. The hall gave me a feeling that there was a message here. The particular hall being evaluated did in fact involve a number of major themes, including glaciation, periodicity of climate change, sea level changes, giantism, emergence of man, and mass extinction.

My experience is limited but I believe that such carefully developed themes are rare in zoos. One exception is the newly opened predator exhibit at the Birmingham Zoo, which includes insects, cougars, eagles and Siberian tigers in naturalistic environments (AAZPA, 1985). Another is the Burnet Park Zoo, which reopened in 1985 after closing for three years to develop a number of such exhibits including animals as endangered species, extinct animals, animals as social beings and animal adaptations (Burnet Park Zoo, nd). In the paper Ken Nieland presented yesterday, he mentioned that Micke Park Zoo is about to open an exhibit on animal adaptations to tropical forests.

Finally, the most obvious effort by zoos to educate are exhibit signs. After observing people in museums over seven-day spans, 4-5 hours a day, Wolf and Tymitz (1978) report that visitors not only read, but often search for signs. Excluding infants and non-English speakers, almost all visitors read some signs but no visitor reads all of them. Further, visitors seek different kinds of information when they do read the signs.

The investigators conclude that signs should present varied information--scientific, practical, descriptive--to meet the needs of different visitors. Further, signs should proceed from simple to complex. Finally, learning style should be taken into account. Signs at the most simple level might describe and identify. Questions encourage observation and examples acknowledge a third learning style. Finally, signs that describe scientific research or present controversies will interest still other visitors. Such a system probably would

have to be coded so visitors can easily select the information that meet their needs.

Factors Affecting Education in Zoos

Both Linn (1981) and Zyskowski (1981) stress the importance of a detailed knowledge of the particular setting in which an evaluation is to occur. Just what this has meant to researchers becomes clearer when it is recognized that most studies can be grouped conveniently as addressing one of five factors, discussed in turn below.

First, researchers have collected demographic information on visitors. For example, Wolf and Tymitz (1980) interviewed 743 visitors to the Hirshhorn and determined that more females than males visit the museum and that most Black visitors did not live in the area but most White visitors did. Similarly, Shettel (1976) found that the "Man in His Environment" at the Field Museum in Chicago tend to attract young white adults and mixed males and females, primarily from suburban Chicago or from out of town, and that they came to the museum with most of the knowledge and attitudes the exhibit tended to impart. Linn (1981) suggests that information on non-visitors would be useful in developing with marketing plans.

Second, studies have addressed the question of why people come to a museum or a zoo. One way to approach this is to develop a taxonomy of visitor types. Wolf and Tymitz (1978) distinguished four different types of visitor to a Smithsonian exhibit, including the "commuter" who was on the way to somewhere else, the "nomad" or casual visitor, apparently open to becoming interested in something without knowing what or

quite why he was there, the "cafeteria type" who apparently wants to get interested in something and treats the entire museum as a cafeteria, and the "Very Interested Person" who arrives at the exhibit with some prior interest, and who goes through the hall more carefully than others.

Wolf and Tymitz (1978) do not report where the commuters were going, or the proportion of visitors in each category. I find it difficult to distinguish "nomads" and "cafeteria types," would like information on first-time vs. repeat visitors within each of their categories and would like to know whether visitors change from one category to another in various parts of the museum--or zoo. However, I agree strongly with them that it is inappropriate to say that the exhibit was "better" for the VIP than the others. Exhibits should not appeal only to one kind of visitor; the possibility of stimulating all is important. As Linn (1981) points out, a museum--or zoo--is not like a school. All people do not begin with the same level of knowledge or with the same interests, nor must they all learn the same thing.

Third, researchers have addressed the way visitors move through museums and zoos. In a series of studies, Melton (1935) discovered a number of generalizations about visitor movement in exhibit halls. The most basic is a right-turn bias, which can be slightly modified by placement of exits and can be overcome by signs whose effectiveness declines rapidly with their distance from entry doors. Interestingly, the bias cannot be overcome by changes in what is exhibited!

Fourth, researchers have addressed the way visitors use their time at museums and zoos. One aspect of this is how long people spend at a museum or zoo and what they do while there. For example, Wolf and Tymitz (1980) found that most visitors to the Hirshhorn spend at least two hours in the museum, while a small proportion spend as much as four. In another study they report that the weekday crowd at the Smithsonian's Natural History Museum begins to taper off about 3:30 (Wolf & Tymitz, 1978).

Another aspect of the temporal pattern is how long people spend at specific exhibits and what affects this. Wolf and Tymitz (1978) observed that pairs were more attentive than individuals or groups of three or more, and that number people in an exhibit area affects the speed with which later arrivals move through it.

Fifth, Loomis (1974) argues that more information is needed about the social nature of museum visiting, and that innovative strategies in evaluation and some kind of theoretical framework are needed as well. Traditional experimental methods utilizing treatment and control groups are totally inadequate to such studies because of the number of variables affecting social settings and the large number of interactions (in a statistical sense) among them (Campbell, 1973), which force alternative methods based on observation in natural settings on researchers (Cronbach, 1975).

Research Methods

The fifth factor raises the general issue of research methods appropriate to understanding the educational impact of

zoos. Clowes and Wolff (1980) used pre- and post-tests to measure cognitive learning, with little success for a variety of reasons connected with sign quality, instrument sensitivity and sampling.

Wolf and Tymitz (1979) conducted over 300 interviews at the National Zoo, determining that people came to the zoo for for mental and physical relaxation, entertainment, education, and as a family tradition. Elsewhere (Wolf and Tymitz, 1978), suggest limiting interviews to mornings--an important limitation on the method.

In a study to determine the effectiveness of an exhibit in conveying information on evolution at the Smithsonian Wolf and Tymitz (1981) relied on what they call naturalistic evaluation, which they define as observing and interacting with persons during their visit. They first determined by observation the general pattern by which visitors moved through the exhibit, noting "magnet areas" where individuals tended to linger. Then they used interviews to determine impact. Of special interest is their effort to supplement these traditional methods with estimates of interest based such indicators as which exhibits were most often photographed.

Such indicators, variously called unobtrusive or nonreactive, have been discussed in detail by Webb, et. al. (1981). There may be conveniently classified into four major categories. Should you be unfamiliar with the concept, let me give you an example of each. The first category consists of accretion measures. Given two exhibits equi-distant from a refreshment stand, the one where the most trash accumulates is

likely to be the more popular. The second category consists of erosion measures. This morning Roger Hoppes mentioned that the pads of paper provided to take down addresses of conservation organizations disappear quickly. This makes clear what is meant by erosion, although a little work needs to be done to turn it into a usable measure. The third category of nonreactive measures consists of records. Attendance and type of souvenir sales are obvious examples, but, referring again to Roger Hoppes's paper, some exhibit manipulation and the numbers of letters received by conservation organizations might provide information on the proportion of people who write down addresses actually act. The fourth and final category of nonreactive measures is observation, whether or not manipulated. I intentionally depart from my zoo examples to mention a study that found that the more culture-bound people are, the flashier are the shoes they wear (Gearing, 1952).

While no more capable of answering all research questions than any other method, nonreactive measures have some particularly attractive features for those interested in the educational impact of zoos. Foremost among them is collecting data without interfering with patrons who have come to the zoo to relax, not to become subjects of research.

RESEARCH ON THE EDUCATIONAL IMPACT OF ZOOS

The half dozen research projects described below were conducted by six teams of three graduate students at the Los Angeles Zoo. I am grateful to the Zoo, and in particular to Dr. Cathleen Cox, Director of Research, for extending permission to

use the facility and hope that eventually it the benefit becomes mutual. But, the many failings of the initial work, which must be laid at my door, and not at theirs, leave me far short of that goal.

Students were enrollees in a third-quarter graduate social science research methods course. That is, the research itself is an example of the fourth educational role of zoos that I mentioned earlier. Specifically, students were not particularly interested in zoos, or in animals, but were there to further develop skills in research design, data collection and proposal writing. Additional course goals included learning to conduct research as a team member, learning to work under deadline pressures as experienced by contract researchers and learning to present results both orally and in writing.

Students were introduced to the zoo on the first week of the class and required to conceptualize their research, write a proposal following a format simulating federal grant requirements (including such components as budget and GANTT charts), submit it to myself and Dr. Cox for approval (simulating the federal peer review process), rewrite completely (one of the six) and revise parts of the proposal (two of the six) to reach minimum standards, collect and analyze data, complete a final report following the format usually required of theses, and only ten weeks after the start of the course, present it to an audience of classmates and guests including zoo keepers and students enrolled in prerequisite courses (which simulated the conditions of a professional conference). The six projects are described in turn below.

1. P. Ricci, G. Sova and J. Squires. Visitor Turning Preference in a Zoo.

Among the studies of spatial dimensions of visitor behavior, Melton (1935) established a "right-turn bias" in museum visitors that has strongly influence exhibit design since. The Los Angeles Zoo is built in a canyon, so that turns are not just right or left, but also level, up or down. Intersections are T-shaped, so that six carefully selected intersections can cover every possible combination of direction and grade. Unfortunately, students do not always listen to instructors, or to put the blame where it belongs, instructors do not always supervise as closely as they should. Data was collected at only three intersections. None of these involved all three possible grades. Further, one of the intersections selected included the only path visitors could take to or from the entrance and exit.

Each team member completed nine 45 minute observation periods recording turns at one intersection from the three possible approaches for 15 minutes each. Observers rotated among the three intersections starting at 1030, 1230 and 1430 on three separate Saturdays. Certain categories of visitors, such as those pushing strollers or wheelchairs, were not counted.

Although the limitations mentioned above limit interpretation, results bore out expectations. Choice of direction is influenced more by terrain grade, by time of day and by the interaction of the two than by direction. That is, people tend to turn left rather than right if that will avoid going up hill, and they are more likely to do so as the day

wears on. In the Los Angeles Zoo, this insures more traffic early in the day for certain exhibits (aquatics, Australia, Africa) than for others (flight cage, South America, Asia). Knowing that visitors prefer seeing active to sleeping animals, this has potential, though probably impractical, implications, for where animals are exhibited.

Apart from the need to replicate the study to correct some technical shortcomings, the researchers suggested that frequency of zoo visits, reading directional signs, exit bias, exhibit value, snack stands (which seem to have exerted a stronger pull as the day lengthened), animal noises, and shade are among additional variables that influence choice and should be controlled. Particularly at the intersection leading to the entrance, they observed that visitors who turned right (and up) did not stop to read the sign as frequently as those who turned left, leading to speculation that they were frequent visitors who knew what they wanted to see--Wolf and Tymitz's (1978) VIPs, described above. This provides a potential method for nonreactive sampling of first-time vs. frequent visitors (although a simpler method is identifying members vs. non-members by ticket type at entry to the zoo).

2. M. Bowman, M. Hamamura and C. Stockton-Payne. Determinants of the Holding Power of Zoo Exhibits.

Linn (1981) reported learning is positively correlated with time spent at museum exhibits. Loomis (1974) and Clowes and Wolff (1981) reported that time spent at an exhibit is itself influenced by number of visitors in a group and Wolf and Tymitz (1978) reported that it is influenced by number of people in an

exhibit area and by time of day.

This team set out to study the possible impact of these three factors on exhibit holding power by collecting data at nine Los Angeles Zoo exhibit areas known locally as "roundhouses." These are partially enclosed circular areas containing 2-3 animal exhibits each.

Data collection required counting the number of people in each group entering a roundhouse and timing how long the group remained in it. Of 1440 groups observed, 38% involved two people, and 36% involved three or four people. Individual visitors comprised 11% of those observed. Groups of 5 or more were rare, and groups of seven or more so rare that they were combined for reporting.

An unexpected difficulty was determining where the lagging members of one group ended and the advance members of another began. The group did not clearly resolve whether to time a group based on the arrival and departure of the first or the last group member, or whether to use a group mean. Worse, in another example of poor supervision that I did not discover till I read the final report, the students rounded times of each group to whole minutes, obscuring any effects that may be present. There was no control for number of exhibits per roundhouse or activity level of animals.

Early in the data collection phase--that is, after the study design had been approved--the team noticed that visitors spent less time per exhibit in the afternoon than in the morning. They hypothesized that this was because visitors were

tiring (perhaps because they tired in the afternoons themselves). An alternative explanation is that visitors are trying to see as much as possible before leaving. I proposed determining time spent at refreshment stands to test these rival hypotheses. If the first idea is correct, visitors will take longer breaks in the afternoon than in the morning; if the second is correct, the opposite will be the case. For these reasons, no conclusions can be drawn from this effort.

3. L. Buck, C. Norris, M. Drulias. Reading Signs at Zoo Exhibits

An obvious research question is the proportion of visitors that read exhibit signs. This group further assumed that people read from left to right, and that the proportion of the sign that has been read can be determined from the time spent reading. They hypothesized for reasons that need not trouble us here that more women than men would read signs, and that they would do so more thoroughly than men. The Los Angeles Zoo has been involved in an ambitious project to modernize its signs. Careful attention was given to factors such as placement, durability, legibility and design. The new signs have three sections, the left comprising a drawing of the animal (crucial in a zoo committed to mixed exhibits); its English, Spanish and scientific name; and (if appropriate) the universal symbol for an endangered species. The central section always covers range, food and basic facts. The right-hand section adds some interesting additional information, such as a special adaptation to the environment. Estimates were made of the average time needed to read each section of the tiger and ruffed

lemur signs.

The researchers collected data on the proportion of visitors who read any part of the signs at these two exhibits. In addition, they timed how long each person who did read the sign spent doing so. The sample consisted of all adult visitors (determined by height as measured by the exhibit fences), distinguished by sex, who visited the exhibits between 1030 and 1130, 1230 and 1330 or 1430 and 1530 on two successive Saturdays. Results are summarized in Table 1. This group also failed to test their hypotheses statistically.

But, there were potentially important unexpected results. As mentioned earlier Wolf and Tymitz (1978) suggested sign complexity as a factor in exhibit design. Therefore, the reading level of 29 of the new signs was estimated from the central and right-hand sections of the signs using a computer program developed by the Minnesota Educational Computing Consortium. Table 2 presents Flesch and Gunning-Fog readability analyses of 27 Los Angeles Zoo signs, arranged in ascending order according to the Gunning-Fog index for the entire sign.

The index numbers exhibit considerable variation. This variation is to be found not only from one sign to another but between the two sections of a small number of the signs (e.g., the cavy and the dingo). Frequently (but not always), the central section, which we assume is the first to be read, has the higher readability level, which may discourage some readers from continuing to the easier--but more detailed information on the right.

Therefore, the Los Angeles Zoo is a natural laboratory to test the reading levels at which signs should be presented. A replication of this study with exhibits selected to encompass several reading levels clearly is indicated. Confounding of results with such factors as type and activity level of animals, presence of babies, unexpected events and special characteristics of Los Angeles Zoo visitors will limit generalizability but replication of the study can begin to test hypotheses such as:

More females than males read signs.

Females spend more time reading signs than males

The more uncommon the animal, the more likely visitors are to read signs.

Visitors are more likely to read signs if infants are present, or if some other unusual event (such as the lemurs' sifaka) attracts them.

The proportion of a sign read can be inferred from the amount of time spent reading it.

The lower the reading level of the sign, the greater the number of visitors who read it.

4. J. Frank, L. Zimbelman, G. Thomas. Childrens' Reactions to Animals in a Petting Zoo.

Learning is not strictly a matter of acquiring facts, but also involves development of attitudes. It is at least arguable that a zoo is more important for its affective than its cognitive educational potential. A sign and a glance at an animal is unlikely to compete successfully as a means of providing information with television programs, school courses

and general reading. But, all of these are structured by someone else for purposes selected by someone else, and none provide the immediacy of a live animal. Most zoos have an area where this immediacy extends to petting and feeding animals such as sheep, ducks and goats.

This study was conducted to determine the relative attractiveness to children of the sheep, goats and ducks in the petting zoo, and to identify the nature of the interactions children have with these animals. Interactions were classified as positive, negative or neutral based on predetermined behaviors such as feeding an animal or kicking it. Feeding paper to goats was classified as negative although I argued unsuccessfully that children undoubtedly did not perceive their activity as abusive in view of the widespread notion that the animals eat such items with relish.

The petting zoo is a cul-de-sac to the right of the entrance shared with the baby nursery, a snack area, "discovery circle" where lectures using animals such as ferrets and barn owls are given by Docents, and two or three other miscellaneous exhibits. 1005 children (475 boys and 530 girls) were observed in a six hour period across two Saturdays. Attendance was distributed roughly evenly across the morning, mid-day and afternoon observation periods and did not account for behavioral differences.

Goats proved more popular than ducks, and ducks more popular than sheep. Goats drew the greatest amount of positive response, ducks the greatest amount of neutral response (probably because they had to be attracted to the edge of their

pool), and sheep drew the greatest amount of negative response. Girls demonstrated more negative reactions than boys, but both aggression toward and fear of animals were included in this category. Data collection was limited to three of the six types of animals in the exhibit, simply because there were three researchers (who rotated assignments to balance any internal bias). This is a reminder that real-world research has limits not present in the idealized designs of the textbooks. Again, analysis failed to exhaust the potential of the data.

5. B. Berman, D. Earnest, D. Silver. Animal Stereotypes.

Animals dominate the earliest tales children hear and may influence attitudes toward specific species. Bettelheim (1977) asserts that these tales are cast in absolutes to accommodate the inability of children to understand shades of meaning. They involve characters who are either fierce, ugly and evil or are kind, beautiful and perfectly good. These uni-dimensional characters are important to a child's development because they provide an initial way of organizing experiences and feelings consistent with intellectual abilities. The possibility exists that these tales, and other early sources including television cartoons and commercials, create animal stereotypes that are not easily erased by later, factual, information. The persistence of these early concepts is seen in the common use of animal metaphors to describe people.

To provide some systematic information on whether zoo visitors hold stereotypes about some animals, the first two comments made by visitors (selected according to a sampling plan

that was simple, practical and approximately random) were determined by eavesdropping researchers at the timber wolf, sloth bear and African elephant exhibits. Comments recorded by one researcher were rated as positive, negative or neutral toward the animal by the remaining two, permitting an inter-rater determination of reliability. Raters also noted comments originating in children's literature. An obvious difficulty here is the possibility that a comment would go unrecognized as having such an origin, but the bias insures that effects of interest will be under- rather than over-estimated. Data analysis limited to Q-sorting was utilized to examine specific comments in terms of such independent variables as sex, age and species. This procedure was adequate to find evidence of differential response to animals shaped by children's literature.

Visitors were generally fearful of wolves. Characteristic were visitors who feared the animals might swim the moat, in which case they feared being eaten "in a bite." Children often pointed and made remarks such as "Look! There's the Big Bad Wolf" or "He'll huff and he'll puff and he'll blow your house down."

Elephants evoked almost no negative comments; children were highly positive and adults generally neutral. Female children and adults, and male children, but not male adults, made a high number of comments judged to originate in literature. Children frequently called the elephants Dumbo or Babar.

Bears were perceived as clown-like. They evoked few negative comments, and many of them pertained to the animals'

claws. People appeared to be surprised that bears had such threatening-looking claws. It was as if the claws did not fit their stereotype. As the exhibit housed three bears, the team was forced to discard a number of probable literary references as ambiguous, but comments such as "There's the mommy bear" left little doubt as to the source of the comment.

A high number of non-relevant remarks (e.g., comments about food, restrooms or a parent telling a child not to stand on a rail) obviated statistical analysis by flooding the neutral cell. In replicating the study there is the need to exclude remarks unrelated to animals while preserving only those that represent "gut" reactions. The team suggested that socio-economic and cultural factors also should be controlled in future. One way to do so is by developing nonreactive measures of social class such as that suggested by the Gearing study cited above as an example of collecting data by unobtrusive observation. Another is to collect data from the non-English speakers who visit the zoo. The team also suggested collecting data while animals are active rather than at arbitrary times of day. Finally, they suggested collection of data on a wider range of animals and efforts to identify a wider range of attitudes, particularly anthroponorphic or ecological in origin. This clearly is a fertile area for research that we will continue to pursue.

6. J. Daniels, N. O' Brien, R. Saria. Intergenerational Communication

The final team selected a study responsive to the suggestion by Loomis (1974) that the social nature of museum

(and, by extension, zoo) visiting should be addressed, but required innovative methods and a theoretical framework. As the team consisted entirely of students working on masters degrees in gerontology, they were interested primarily in elderly visitors. One setting in which the elderly are commonly seen in public is when grandparents bring grandchildren to the zoo.

Eight groups of senior citizens accompanied by children were followed for one hour each to record the nonverbal behavior and conversation of seniors with accompanying children. Lacking sophisticated recording equipment this required standing close enough to groups to overhear without being detected, a feat accomplished by a system of rotating observers that left all feeling they were in a 1940's private eye movie. The amazing thing is how well such a clumsy system seemed to work.

A multiple-rater system of content analysis was utilized to determine major characteristics of the interaction between senior citizens (assumed and often proven to be grandparents) and children. The analysis suggests that a typology of interactions can be developed, the researchers proposing three types (two-way, one-way and no-way). Five groups were judged to be instructive, by such means as the senior reading a sign to a child, pointing out and describing animals or asking questions relating to animals. These cases clearly demonstrated the combined recreational and educational nature of zoo visits.

Six groups, including all five instructive ones, were judged to be mutually affectionate. Affection appeared independent of the child's sex. In the two cases falling into

the "no-way" typology, the seniors were authoritative and noninstructive and the children unresponsive. Several groups included two or more seniors. In these instances, most of the intergenerational interaction was senior female and children, and the female was in control. The males remained detached both emotionally and physically. This is consistent with Neugarten's (1973) finding that women become more dominant and men become more passive as they age.

This team proposed a dozen questions for future research, four each pertaining to social interaction, research methods and human behavior in zoos. For example, they suggest determining the typical path followed by zoo visitors, a question inspired by the realization that 7 of the 8 groups followed almost precisely the same route and reached almost exactly the same point in the one hour during which each was followed. Such a study would of course supplement the first two studies reported above.

CONCLUSION

Nonreactive measures are particularly appropriate for evaluating the educational impact of zoos on recreational visitors because they do not impose on visitors or require their cooperation, and because they reduce problems with sampling and response bias. But, imagination, development, trial and improvement are required to approach their potential. They should then be used in conjunction with more traditional methods to obtain the most reliable and valid possible answer to the larger question of how and what recreational visitors learn at zoos.

In presenting the results of the initial six studies, I emphasized mistakes more than results. It is an old cliche that we learn from our mistakes, but I have tried to be fairly specific as to how several of the studies can be improved. All of the projects reported above led to ideas for methodological improvements. All led to development of more precise or more useful research questions.

Taking this tone may give the appearance that little was accomplished. That is not the case. The first group of six studies made great strides in defining research problems, reviewing past literature and wrestling with the difficulties of an unusual data collection strategy. Care has been taken to insure that the group of students who will take part in the second round of studies will start from where the first group left off, rather than simply repeat the same mistakes. The major devices include (1) use of data from the initial studies to teach specific statistical techniques in the first prerequisite course, (2) presentation of critiques of several of the initial studies as part of the second prerequisite course, (3) revision of proposal guidelines to emphasize data analysis, and (4) preparation of copies for each new team of abstracts of all literature reviewed by the initial teams (and much more done since), of the detailed critiques of the proposals prepared by the initial teams, and of this paper. Despite some foreseeable problems, and some that will surprise me, I expect to begin work that truly will build on the past when the new teams assemble in less than ten days.

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Table 1

Sign Reading at Two Exhibits

	First Hour	Second Hour	Third Hour	Totals
Tigers				
Visitors	194	433	472	1099
Readers	23 (11%)	68 (15%)	68 (14%)	159 (14%)
Reading time				
Males	33.27"	31.54"	34.13"	
Female	27.70"	26.76	36.89	
Lemurs				
Visitors	74	166	196	436
Readers	23 (31%)	38 (23%)	70 (35%)	131 (30%)
Reading time				
Males	8.36"	10.82"	10.29"	
Females	20.83"	7.72"	8.99"	

TABLE 2

EXHIBIT	WORDS CENTRAL	READING LEVEL: FL	G-F	WORDS RIGHT	READING LEVEL: FL	G-F	WORDS TOTAL	READING LEVEL: FL	G-F
Grey Seal	62	7	6.3	20	7	4.7	82	7	5.6
Polar Bear	69		6.3	24		4.9	93		5.9
Emu	63	8	7.4	54	9	8.4	117	8	7.8
Wombat	64	8	8.9	31	7	6.7	95	7	8.1
Gibbon	64	7	10.1	23	7	7.5	87	7	8.9
Cavy	52	12	11.1	25	7	4.9	77	9	9.0
Capybara	59	11	10.2	44	7	8.0	103	9	9.2
Dingo	61	8	8.7	31	14	11.4	92	10	9.4
Coyote	63	11	10.1	22	8	8.4	85	10	9.4
Sea Lion	57	9	11.3	36		7.0	93	7	9.6
Racoon	64	11	10.5	26	11	10.5	90	10	9.8
Ruffed Lemur	64	11	10.1	22	12	9.9	86	11	10.0
Bison	70	8	9.2	47	11	11.4	117	9	10.1
Sloth Bear	64	9	11.1	28	9	8.5	92	9	10.3
Grey Kangaroo	72	10	10.2	21	10	12.2	93	10	10.5
Elephant	66	11	11.9	37	7	8.2	103	9	10.6
Pelican	59	12	12.0	37	9	9.1	96	11	10.6
Giraffe	61	9	10.8	25	10	11.3	86	10	10.8
Wooly Monkey	66	11	11.7	26	10	11.6	92	11	11.0
Porcupine	62	10	12.1	17	7	9.3	79	9	11.0
Indian Rhino	71	8	11	0			71	8	11.0
Otter	53	12	11.0	24	9	11.5	77	11	11.2
Chimpanzee	52	10	11.4	35	12	12.7	87	11	11.9
Gorilla	74	10	12.3	25	14	11.4	99	11	12.1
Alligator	51	16	15.8	36	9	8.1	87	14	12.6
Tapir	59	14	12.9	18	17	12.5	77	16	12.7
Tiger	62	12	13.3	39	12	12.4	101	12	12.9
Orangutan	64	9	13.2	20	14	16.0	84	10	13.8
Gal. Tortoise	58	16	15.7	35	10	12.7	93	14	14.5

FL = Flesh, which uses words per sentence and syllables per 100 words to estimate grade reading level based on sentence complexity. Ratings below grade 7 are unreliable and shown as blanks.

GF = Gunning-Fog, which uses number of three or more syllable words and average sentence length to estimate grade reading level. Developed to evaluated readability of newspaper stories.